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ABSTRACT

To test the hypothesis that stimulus-seeking and extraversion underlie "exercise addiction" and sport involvement, the relationships among stimulus-seeking, extraversion, and exercise frequency were examined in ninety males matched on age and educational level. The Stimulus Variation Seeking Scale, Sensation-Seeking Scale (SSS) and Eysenck Personality Inventory (EPI) were administered to thirty regular, thirty occasional, and thirty nonexercisers. Interpretation of the test scores revealed that regular and occasional exercisers scored significantly higher on the SSS Thrill and Adventure Seeking Scale and lower on the EPI Neuroticism Scale (N) than nonexercisers. Extraversion was positively correlated to stimulus-seeking but did not differentiate among groups. These results indicate that at least one form of stimulus-seeking, (thrill and adventure seeking) may be a motivating force in physical activity and sport participation, but it does not distinguish subjects on the basis of exercise frequency and is not a factor in exercise addiction. Higher levels of stability in exercisers may reflect the feeling of well-being that they report gaining from vigorous physical activity, rather than being due to some emotional liability on the part of nonexercisers. (Author/MB)

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Stimulus-Seeking, Extraversion, and Neuroticism in Regular, Occasional, and Non-Exercisers

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RUNNING HEAD: EXERCISE ADDICTION AND SPORT INVOLVEMENT

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Those who participate regularly in vigorous physical activity frequently state that they feel better as a result of exercise. Studies of regular exercisers (3) and middle-aged men participating in an exercise program (21) have indicated that the associated feeling of well-being is a strong motivator for continued participation in physical activity. There have even been indications that regular exercisers can become dependent on physical activity for their well-being. However, this speculated dependence upon physical activity has been explored in very few studies.

Studies which have investigated this relationship contain hypotheses which are based upon arousal theory. Optimal level of arousal theory (4, 7, 8, 20, 30) suggests that maintenance of an optimal or "best" level of stimulation is sought by each of us on levels which are not necessarily conscious. Since individuals vary in their need for stimuli, it may be that only certain types of individuals become regular exercisers, and because of their psychological makeup are less able to cope with exercise deprivation than non-exercisers. Ellis (8) suggests a purely neurological basis for this. According to Ellis' conceptual model, individuals differ in arousal requirements in accordance with the functioning of their reticular activating systems. Those whose optimal arousal levels are high tend to be stimulus seekers.

Eysenck (9) suggests that the traits of extraversion and introversion respectively represent the inhibitory and excitatory functions of the central nervous system and involve the reticular activating system. Thus, personality is a function of "trait" arousal. In theory, cortical excitation in response to stimuli is lower in extraverts than in introverts because the nervous system of extraverts has "stronger"

inhibitory capabilities. This characteristic of extraversion may account for a strong need for sensory variation. Therefore the extravert dislikes repetitive tasks and seeks more changes in stimuli than do introverts (11, 14, 22).

There is some support for the viewpoint that the psychological makeup of regular exercisers differs from that of sedentary people. Numerous studies have indicated that people who are highly physically active tend to be more emotionally stable and more extraverted than non-exercisers (3, 5, 19, 21, 24, 26).

Optimal level of arousal theory and the Eysenckian notion of extraversion appear to offer an acceptable framework within which to study the phenomenon of exercise dependence. Therefore the purpose of this study was to compare the stimulus-seeking preferences and extraversion scores of regular, occasional, and non-exercisers.

METHOD

Subjects were recruited through a pilot study in which male graduate students and faculty at Florida State University, Tallahassee, Florida, were asked to respond to an exercise frequency form. Approximately 1,200 forms were distributed and of these, 67 regular exercisers, 117 occasional exercisers, and 166 non-exercisers returned the forms. Additional regular ($n = 46$) and occasional exercisers ($n = 6$) were recruited from the Tallahassee Gulf Winds Track Club, the Northwest Florida Track Club (Ft. Walton Beach), and a noontime swimming group at Florida State University. After verbal consent for testing was obtained, questionnaires were mailed to 51 regular, 55 occasional, and 59

non-exercisers of a similar age distribution and educational level (last year of school completed). The materials were returned by 47 (92%) regular exercisers, 41 (74.5%) occasional exercisers, and 35 (59.3%) non-exercisers. The final subject sample used for data analysis consisted of 30 subjects ranging in age from 20 to 50 years randomly selected from each of the three exercise frequency groups (total N = 90).

The Eysenck Personality Inventory (EPI) (10) was used to measure extraversion-introversion (E) and neuroticism-stability (N) in subjects. Each of these traits is measured by means of 24 true-false questions, selected on the basis of item and factor analyses. The EPI was selected for use in this study because extraversion is allegedly a neurally-based personality attribute which reflects the inhibitory and excitatory functions of the reticular activating system (9). Thus it is a function of arousal and may be closely tied to stimulus-seeking needs.

The Sensation-Seeking Scale (SSS) (20) was also administered to subjects in this study. This instrument contains 36 forced-choice items paired for equal social desirability and divided into five subscales (29):

1. Thrill and Adventure Seeking Scale (TA) which expresses a desire to participate in outdoor sports or other activities involving disequilibrium, speed or risk;

2. Experience Seeking Scale (ES) which enables expression of need for a broad variety of inner experiences gained via travel, drugs, music, art, nonconforming behavior and dress, associating with unconventional people, and resisting irrational authority;

3. Disinhibition Scale (DIS) which permits expression of a hedonistic, extraverted philosophy including a preference for loss of social

inhibition through social drinking, sexual variety, "wild" parties and gambling;

4. Boredom Susceptibility Scale (BS) which permits expression of a dislike of repetition, the routine and predictable, dull or boring people, and a restless reaction to monotony; and a

5. General Sensation Seeking Scale (GEN) which measures preference for extremes of sensation, novelty and adventure, thrills, social stimulation, and general excitement.

The SSS was selected because it is based on the concept of an optimal arousal level and is the most thoroughly researched test which purports to measure this construct. The forced-choice format has been shown to effectively control the social desirability factor in answering (12) and finally, the SSS includes five scales which tap different forms of stimulus-seeking, whereas most other scales are only general measures.

A third instrument administered to subjects was the Stimulus-Variation Seeking Scale (SVS) (23). It is theoretically grounded in the optimal arousal concept and is designed to measure need for exteroceptive stimulus change. This instrument consists of 100 statements to which the subject is asked to either agree or disagree. According to this instrument, an exteroceptive stimulus variation seeker is one who: approaches and explores relatively new stimulus situations as well as incongruous and complex stimuli (23).

The SVS was selected because it aims to measure exteroceptive stimulus-variation seeking, which may underlie involvement in sport and physical activity, and it has been correlated to behavioral measures of stimulus-seeking (23).

Scores obtained from the three tests were analyzed with a stepwise

discriminant analysis in order to determine which of the dependent variables was most important in discriminating among the three groups, taking into account the relationships among the three variables. For the variables that discriminated among the groups, a step-down F procedure was applied, followed by the Newman-Keuls Multiple Range Test to determine if the differences among group means were statistically significant. For all initial and follow-up procedures, alpha was set at .05. Test reliability was assessed with the Kuder-Richardson Formula 20.

The following hypotheses were tested in this study:

(1) Regular exercisers achieve significantly higher extraversion and stimulus-seeking scores than occasional and non-exercisers.

(2) Occasional exercisers achieve significantly higher extraversion and stimulus-seeking scores than non-exercisers.

(3) Subjects who participate regularly in a variety of physical activities will have significantly higher stimulus-variation seeking scores than those who participate in only one type of activity.

RESULTS

A total of nine dependent measures was taken from the SVS, SSS, and EPI. The SSS yielded five subscales: General Sensation Seeking (GEN), Thrill and Adventure Seeking (TA), Experience Seeking (ES), Disinhibition (DIS), and Boredom Susceptibility (BS). The EPI included three scales: Extraversion (E), Neuroticism (N), and Lie (L); and the SVS gave a total score. Test means, standard deviations, and KR-20 reli-

ability coefficients by group are given in Table 1. The correlation matrix for all scales is shown in Table 2.

INSERT TABLES 1, 2, 3, AND 4 ABOUT HERE

A stepwise discriminant analysis performed on the dependent variables indicated that the SSS Thrill and Adventure Seeking scale and the EPI Neuroticism scale discriminated significantly among groups. The summary table of this analysis is presented in Table 3. Results of the prediction equation from Table 3 are presented in Table 4, which illustrates the number and percentages of subjects classified into each group by this equation.

Although the regular and occasional exercise groups were poorly differentiated by the prediction equation, when combined into one group 46 (76%) of the 60 exercisers were correctly classified.

Following the stepwise discriminant analysis, a step-down F procedure was followed. A Newman-Keuls Multiple Range Test was applied to the means of the first variable of importance using an ANOVA error variance estimate of 10.7.

Although regular and occasional exercisers' mean scores were not significantly different, both groups scored significantly higher than non-exercisers on TA.

An ANCOVA was performed on the second variable of importance, Neuroticism, using the TA scores as a covariate. Following a significant F (2, 86) = 4.2, p < .05, a Newman-Keuls test was applied to the ad-

justed means using the adjusted error variance. Both regular and occasional exercisers scored significantly lower on the Neuroticism scale than non-exercisers.

A stepwise discriminant analysis performed between two sub-groups of regular exercisers, single sport (n = 19) and multiple sport (n = 11) participants[1], indicated that there was no significant difference between their scores on extraversion or stimulus-seeking.

DISCUSSION

Two of the nine variables measured accounted for a significant portion of the variance among groups. Both regular and occasional exercisers were found to differ significantly from non-exercisers on Thrill and Adventure Seeking (TA) and Neuroticism (N). Scores on these two measures divided subjects into groups of exercise participants and nonparticipants rather than into three clearly defined exercise frequency groups. TA and N seem to reflect whether a person seeks out or avoids strenuous physical activity but bear little or no relationship to the intensity of his involvement.

In this study, men who exercised a minimum of two days per week scored significantly higher on TA than non-exercisers. Apparently, stimulus-seeking in exercisers is not a generalized phenomenon, but is specific to the active seeking of external sensations through participation in movement-oriented activities. Exercisers' optimal arousal level is not generally high, but is higher than the optimal arousal level of non-exercisers in sport and physical activity participation. To maintain their optimal arousal, exercisers as compared to non-exer-

cisers require greater amounts of sensory input which is in their cases gained through physical activity. A high need for TA stimuli in addicted exercisers may clarify the withdrawal symptoms which they experience when deprived of their accustomed physical activity (1). Even if stimulus needs are being met in other areas, exercisers may not be able to meet these needs to maintain optimal arousal unless they can obtain stimuli via sports or other vigorous physical activities which generate large amounts of kinesthetic stimuli.

Although the etiology of stimulus-seeking tendencies is unclear, both genetic and environmental factors probably interact to produce certain stimulus-seeking preferences. Exercise participation may be a cause or a result of higher TA seeking tendencies in exercisers. Some individuals may be genetically predisposed to respond to kinesthetic stimuli with an adjustment toward optimal arousal, while other individuals may experience a disruption in their arousal level. If heredity plays a large part in stimulus-seeking preferences, this might indicate to physical educators and coaches that if a student is low in TA, it may be futile to force him into physical activity. His stimulus needs in the external sensation category could be low and physical activity beyond his personal requirement would result in unpleasant overstimulation, which he would learn to avoid (17). If on the other hand, exercise participation can increase a person's TA requirements, it is likely that those who are encouraged to participate in physical activity at an early age are those who will develop high TA seeking tendencies and continue to participate in strenuous physical activity throughout their lives.

Regular and occasional exercisers were not differentiated by the TA

scale. Therefore, with respect to exercise addiction, it is apparent that although sensation-seeking may play a part in motivation for participation in physical activity, it does not distinguish addicted regular exercisers from those who exercise only two or three days per week.

Stimulus-Seeking and Extraversion

All six measures of stimulus-seeking correlated significantly to extraversion with coefficients ranging from r = .25 (p .05) to r = .53 (p .01) (see Table 2). This finding is consonant with other reported correlations ranging from .23 to .58 between E and the SSS (2, 12, 13, 28, 29, 30). Such evidence lends credence to the hypotheses that stimulus seeking is related to a characteristic type of personality and that extraverts are stimulus seekers who need greater variety of stimuli than introverts to maintain their optimal arousal level (10, 28).

Stimulus-Seeking and Age

Other studies have found a decline in general sensation seeking with age (28), however, in this study age was found to correlate only with DIS (r = .20) and BS (r = .25) (p .05) (See Table 2). This indicates that older as compared to younger men tend to adopt a more hedonistic, extraverted philosophy, have fewer social inhibitions, and have a greater dislike for repetition, routine, and monotony.

Neuroticism and Exercise Frequency

An additional finding was that the exercise participant groups scored significantly lower on N than the non-exercisers. According to Eysenck and Eysenck (10), high scoring individuals tend to be emotionally overresponsive and frequently complain of minor somatic upsets such as headaches, digestive troubles, insomnia, backaches, etc. They also report many worries, anxieties, and other disagreeable emotional feel-

ings. Low scoring individuals, by contrast, are emotionally stable and not as likely to worry, become upset over minor frustrations, or suffer minor psychosomatic disorders. The mean N score of non-exercisers falls in the 58th percentile, well within normal range. The scores for exercisers fall near the 37th percentile, toward the stability end of the neuroticism-stability continuum. Apparently, the scores of non-exercisers in this study do not fall within the "neurotic" range, but exercisers do tend toward greater emotional stability. This may lend support to the claim by exercisers that a feeling of well-being accompanies participation in vigorous physical activity (6, 16). Other researchers have noted higher levels of emotional stability in physically active people. Sperling (25) found 171 varsity athletes and 133 intramural participants to be more emotionally stable (Human Behavior Inventory) than nonathletes. Later, Ismail and Trachtman (18) found a group of physically fit men to be more emotionally stable than unfit men (Cattell 16PF), but after a four month jogging program, the low fit group had increased in emotional stability so markedly that there was no longer a significant difference between the groups. Such a result might possibly be due to improved health, a feeling of increased physical and mental well-being and pleasant fatigue. Improved health and improved muscle tone would tend to reduce minor physical problems such as backaches. Mild fatigue which results from strenuous physical activity could decrease excessive tension which underlies headaches, minor digestive upsets and unnecessary worrying, as well as promoting improved sleep.

It was not possible to determine if lower neuroticism was the result or cause of exercise participation in this study. Possibly only

persons with low levels of neuroticism seek out and participate in physical activity. On the other hand, regardless of their original level of neuroticism, persons who embark on an exercise program may derive some psychological benefit resulting in increased emotional stability. If neuroticism can be altered by a program of regular physical activity, as indicated by Ismail and Trachtman (18), then exercise may prove to be a valuable part of many mental health programs. Certainly there is considerable testimony from exercisers (6, 16) and psychiatrists (15) alike that exercise can improve one's state of mind, and that deprivation of exercise in regular addicted exercisers can have the opposite effect (1, 15, 16).

FOOTNOTE

1. Some subjects participated regularly in only one sport activity and others, in more than one.

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Table 1

Test Means, Standard Deviations, Reliabilities, and Univariate F Ratios for Regular, Occasional, and Non-Exercisers

Test		Regular Ex.		Occasional Ex.		Non-Ex.		KR-20	Univariate F
		X	SD	X	SD	X	SD		
SVS		59.4	9.6	59.4	9.5	54.3	13.4	.85	1.67
SSS:	Gen	11.3	4.2	12.6	3.5	9.8	4.5	.75	3.58*
	TA	9.3	3.3	10.5	2.7	7.7	3.7	.82	5.80*
	ES	7.6	4.5	8.7	3.9	7.5	4.2	.82	.73
	Dis	5.4	3.2	5.7	2.8	5.6	3.2	.76	.06
	BS	6.2	2.6	6.9	2.9	6.1	3.5	.65	.56
EPI:	E	9.2	3.8	11.0	4.0	8.6	3.7	.72	3.03
	N	7.6	4.5	7.5	3.1	10.5	4.6	.80	5.13*
	L	3.0	1.6	2.5	1.3	2.9	1.7	.40	1.18

* F (2, 87) = 3.10 p .05

Table 2

Within Groups Correlation Matrix for the SVS, SSS, EPI, and Age

Variables		Age	SVS	SSS					EPI	
				GEN	TA	ES	DIS	BS	E	N
SVS		.05								
SSS:	GEN	.14	.35*							
	TA	.02	.32*	.81*						
	ES	.03	.42*	.70*	.54*					
	DIS	.20**	.34*	.50*	.37*	.59*				
	BS	.25**	.37*	.64*	.38*	.57*	.54*			
EPI:	E	-.13	.23*	.29*	.28*	.51*	.53*	.25**		
	N	.01	.02	.01	-.04	-.08	.00	.02	-.06	
	L	-.15	-.20**	-.30*	-.33*	-.43*	-.49*	-.21**	-.33*	-.2

*p .01
**p .05

Table 3

Stepwise Discriminant Analysis Summary Table

Step	Variable	Univariate F	df	Step-down F	df
1	TA	5.8*	2, 87	5.8*	2, 87
2	N	5.1*	2, 87	4.2*	2, 86

Prediction Equation: $Y = x_1 (.89) + x_2 (.47) - 7.06$

$p < .05$ Overall F (4, 172) = 4.96

Table 4

Number of Subjects Classified into Groups

Group	Regular Ex.	Occasional Ex.	Non-Ex.
Regular Exercisers	6 (20%)	15 (50%)	9 (30%)
Occasional Exercisers	4 (13%)	21 (70%)	5 (17%)
Non-Exercisers	3 (10%)	8 (27%)	19 (63%)